

BELLCOMM, INC.

955 L'ENFANT PLAZA NORTH, S.W.

WASHINGTON, D.C. 20024

B70 10056

SUBJECT: Comparison of Parameters in High-Bit-
Rate and Low-Bit-Rate Telemetry on
LM-8 (Apollo 14 Mission) - Case 320

DATE: October 23, 1970
FROM: J. E. Johnson

ABSTRACT

The low-bit-rate LM-8 telemetry format includes over half the number of parameters present in the high-bit-rate format. Each parameter is sampled once per second in the low-bit-rate mode, whereas sampling rates as high as 200 per second are present in the high-bit-rate mode. The parameters deleted from the low-bit-rate format are chiefly those not needed for systems monitoring while on the lunar surface.

(NASA-CR-111180)
COMPARISON OF PARAMETERS
IN HIGH-BIT-RATE AND LOW-BIT-RATE TELEMETRY
ON LM-8 /APOLLO 14 MISSION/ (Bellcomm, Inc.)
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MEMORANDUM FOR FILE

This memorandum compares the contents of the high-bit-rate (HBR) and low-bit-rate (LBR) telemetry data streams for LM-8, which will fly on the Apollo 14 mission. The HBR telemetry mode, operating at a 51.2 kbps rate, will be the normal mode when the LM is active in flight and in line-of-sight of the Earth. The LBR mode, operating at a 1.6 kbps rate, will be the normal mode when on the lunar surface, and when behind the moon. In the latter case, the LBR data will be relayed to the CSM where it will be recorded for later dump to the Earth.

Although the LBR mode operates at a 32:1 reduction in data rate compared to the HBR mode, it includes more than 50% of the parameters present in the HBR format. This is made possible by a significant reduction in the sampling rate of some of the parameters. In the HBR mode, sampling rates can be 1, 10, 50, 100, or 200 samples/sec. In the LBR mode, all parameters are sampled only once/sec.

Table 1 summarized the number of parameters present in HBR and LBR formats for different LM subsystems. Analog parameters are encoded into 8-bit PCM words. Bi-levels, or events, are only one bit long, and up to eight events can be packaged into one telemetry "word". LM guidance computer (LGC) words are each 40 bits long, and occupy 5 telemetry "words", and Abort guidance computer (AGS) words are each 24 bits long, occupying 3 telemetry "words".

The data in Table 1 has been summarized from the Telemetry Data Format Control Book for AS-509/SC-110/LM-8, issued by MSC Flight Support Division, December 11, 1969, with revisions up to August 13, 1970. The pertinent sections of this document, including an itemized listing of the parameters present in each format, are attached to this memorandum.

The parameters deleted in the LBR mode can be broadly classified as follows:

- Redundant measurements
- All LGC and AGS computer words
- Most guidance and navigation systems data
- Most LM descent propulsion systems data
- RCS activity data (including control electronics jet driver signal data)

It would appear that the LBR format has been tailored to eliminate the data not necessary while the LM is semi-quiescent on the lunar surface. During most of this time, the guidance and navigation system would be powered-down, the descent stage would have finished its work, and there would be no RCS activity.

While measurement lists for other LM's have not been examined in detail, it could be expected that the telemetry formats for LM's 5 and subsequent are very similar.

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Table 1
Attachment

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Table 1

Number of LM-8 Parameters Transmitted In HBR and LBR Modes

<u>Subsystem</u>	<u>Analog Data</u>		<u>Bi-Levels</u>		<u>Computer Data*</u>	
	<u>HBR</u>	<u>LBR</u>	<u>HBR</u>	<u>LBR</u>	<u>HBR</u>	<u>LBR</u>
Elec. Power	24	19	18	--		
Environ. Control	45	43	30	30		
Prim. G&N	35	11	8	8	5	--
Control Electronics	31	16	48	9		
Abort Guidance	2	2	2	--	3	
Instrumentation & Sci.	16	14	15	15		
Landing Gear	--	--	1	--		
Radars	5	2	6	6		
Ascent Propulsion	18	14	6	2		
Descent Propulsion	38	13	1	--		
Reaction Control	25	18	38	14		
Communications	9	6	--	--		
Pyrotechnics	--	--	10	10		
Totals	248	158	183	94	8	--

*LM Guidance Computer (LGC) words are each 40 bits long. One hundred LCG words are transmitted once each per 2 seconds. These are formatted in the telemetry bit stream as five 8-bit words transmitted 50 times/sec. Abort Guidance Section (AGS) computer words are each 24 bits long. Fifty AGS words are transmitted once each per second. These are formatted as three 8-bit words transmitted 50 times/sec.

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ATTACHMFNT

Pertinent sections from Telemetry Data Format
Control Book, AS-509/SC-110/LM-8, MSC Flight Support
Division, December 11, 1969. (Revised to August 13, 1970).

1.3 LM AIR-TO-GROUND FORMAT

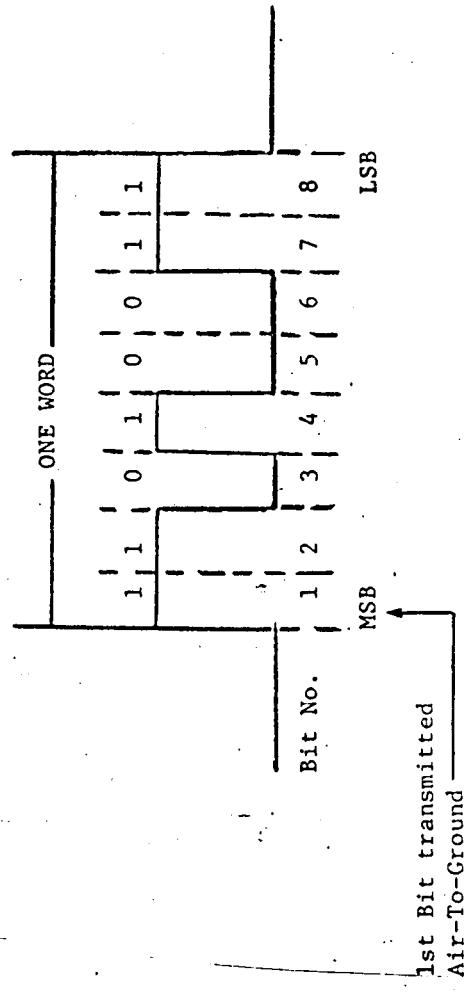
1.3 LM (Lunar Module) Air-to-Ground Formats

The LM PCM telemetry format is described in this section. Parameter lists are located in Section 4.0.

1.3.1 LM BASIC HBR CHARACTERISTICS

The basic characteristics of the LM HBR PCM telemetry are:

- 51,200 bits/sec
- 8 bits/word
- 6,400 words/sec
- 128 words/frame
- 50 prime frames/sub-frame
- 1 sub-frame/sec = 1 data cycle/sec (Except LGC data cycle = 2 sec.)
- 19.53 μ sec bit period
- 156.25 μ sec word period
- 20 msec frame period
- data is transmitted MSB first, MSS first
- sample rates available are 1, 10, 50, 100, 200 s/s
- NRZC data (see example below, with bit numbering convention).



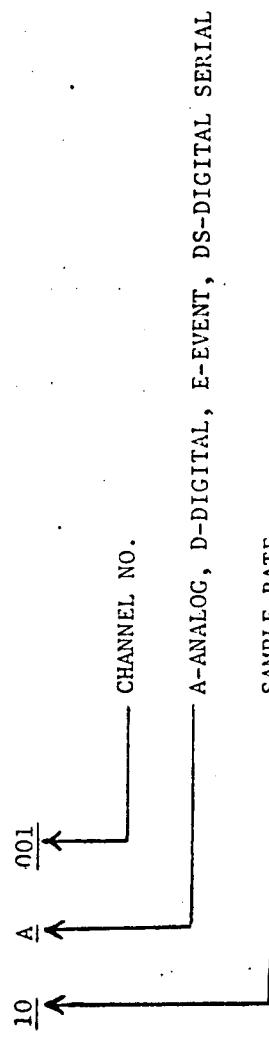
1.3.2 LM BASIC LBR CHARACTERISTICS

The basic LBR (Low Bit Rate) characteristics for LM are:

- 1600 bits/sec.
- 8 bits/word
- 200 words/frame
- 1 frame/data cycle
- 1 data cycle/sec.
- 0.625 As/bit
- 5.0 As/word
- 1.0 sec/frame
- MSB (Bit 1) first, MSS first
- NRZC

1.3.3 LM CHANNEL CODES

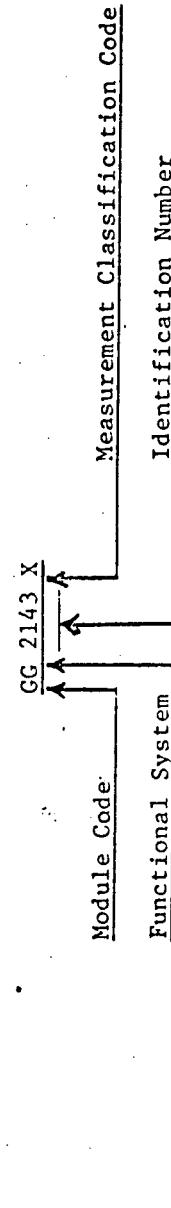
Each data parameter is assigned a Channel Code which is defined below. Channel Codes for a parameter will differ in HBR and LBR as the sample rate varies.



The correlation between channel code and word and frame is shown in the X-Y matrix.

1.3.4 LM MEASUREMENT NUMBERS

The basic measurement number for LM is shown below:



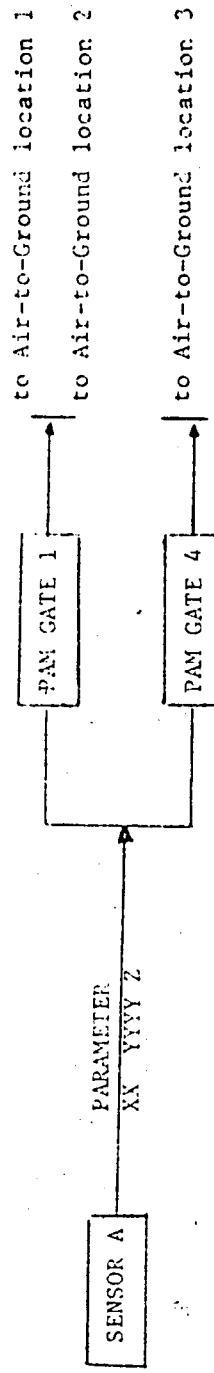
MODULE/FUNCTIONAL SUBSYSTEM CODES

MEASUREMENT CLASSIFICATION CODES

AA	- Adapter Structures	U	- Combination
GC	- LM Electrical Power	C	- Current
GF	- LM Environment Control	X	- Discrete Event
GG	- LM Guidance and Navigation	F	- Frequency
CH	- LM Control Electronics	B	- Phase
CI	- LM Abort Guidance	H	- Position
CL	- LM Instrumentation and Scientific Equipment	E	- Power
CN	- LM Radars	P	- Pressure
GP	- LM Propulsion - Ascent Engine	Q	- Quantity
CQ	- LM Propulsion - Descent Engine	T	- Temperature
GR	- LM Reaction Control	W	- Time
GT	- LM Communications	V	- Voltage
CW	- LM Mission Programming		
GY	- LM Pyrotechnics		

Most LM analog parameters are redundantly loaded in one or more air-to-ground locations necessitating a method to differentiate between the various air-to-ground locations with the same measurement number. This is accomplished by modifying these identical analog measurement numbers with a suffix reflecting the on-board PAM gate loading.

An example of PAM gate loading and the method used to assign suffixes is shown below:



This parameter will have three modified measurement numbers in the Telemetry Format Book as follows:

XX YYYY ZA1	Air-to-Ground Location 1 (A parameter through PAM Gate 1)
XX YYYY ZB1	Air-to-Ground Location 2 (A second parameter through PAM Gate 1)
XX YYYY Z-4	Air-to-Ground Location 3 (Only Channel of PAM Gate 4)

Most LM discretes are downlinked in 2 air-to-ground locations. The measurement numbers of all LM discretes have been modified in order to differentiate between the primary and secondary air-to-ground locations.

GF1081* Primary A/G location.

GF1081+ Secondary A/G location.

The primary A/G location is always transmitted by the site for a required parameter.

1.3.5 LM PAM GATES

The redundant loading of parameters in PAM gates is utilized in the line formats. High speed formats 22, 23, 24, and 25 are contingency formats and will be called up only if there is an on-board failure of PAM gate 1, 2, 3, or 4.

Format 5 can contain parameters loaded in PAM gate 1, 2, 3 or 4 (suffixes -1, -2, -3, -4, respectively).

Format 22 (PAM gate 1 failure contingency format). This format can contain parameters except those loaded in PAM gate 1, i.e., it can contain parameters loaded in PAM gate 2, 3, or 4 (suffixes -2, -3, or -4, respectively). This format will also contain all parameters not effected by PAM gate failure.

Format 23 (PAM gate 2 failure contingency format). This format can contain parameters except those loaded in PAM gate 2, i.e., it can contain parameters loaded in PAM gate 1, 3, or 4 (suffixes -1, -3, or -4, respectively). This format will also contain all parameters not effected by PAM gate failure.

Format 24 (PAM gate 3 failure contingency format). This format can contain parameters except those loaded in PAM gate 3, i.e., it can contain parameters loaded in PAM gate 1, 2, or 4 (suffixes -1, -2, or -4, respectively). This format will also contain all parameters not effected by PAM gate failure.

Format 25 (PAM gate 4 failure contingency). This format can contain parameters except those loaded in PAM gate 4, i.e., it can contain parameters loaded in PAM gate 1, 2, or 3 (suffixes -1, -2, or -3 respectively). This format will also contain all parameters not effected by PAM gate failure.

1.3.6 SYNC and ID

The first 4 words of every prime frame are sync and identification words as described below:

SYNC

1st Bit Transmitted

WORD NO.	NSB 1	LSB 1	NSB 2	LSB 2	NSB 3	LSB 3	NSB 4	LSB 4
BIT NO.	1	2	3	4	5	6	7	8
BIT CONF.	1	1	1	1	0	1	1	0
OCTAL	375		312		150		0	SEE BELOW

FRAME COUNTER

WORD	4	LSB
BIT	3	4
BIT WT.	25	24
EXAMPLE	1	1

= Frame 48

The Sync is the same for LBR and the frame counter is set to "1".

Typical LM parameter configurations are described in Section 3.0

1.3-7

Figure 1.3-1A

LM HBR X-Y MATRIX

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L1: 51.1: KTS (KMH) AIR TO GROUND FORMAT											
SYNC	SYNC	SYNC	SYNC	SPEC AND ID	SEE FOLLOWING PAGE	200E1A	200E1B	200E01	200A01	200A02	200A03
51001A	51001B	51001C	51001D	51001	5	6	7	8	9	10	11
100A01	100A02	100A03	100A04	100A05	100A06	100A07	50E001	100A08	100A09	100A10	100A11
100D01A 10A008 10A018 10A028 10A037	10D001B 10A009 10A019 10A029 10A038	10D001C 10A010 10A020 10A031 10A039	10D001D 10A011 10A021 10A032 10A040	10D001	200E1A	200E1B	200E03	200A01	200A02	200A03	200A04
17	18	19	20	21	22	23	24	25	26	27	28
100D01A 10A008 10A018 10A028 10A037	10D001B 10A009 10A019 10A029 10A038	10D001C 10A010 10A020 10A031 10A039	10D001D 10A011 10A021 10A032 10A040	35	36	37	38	39	40	41	42
100A15	100A16	100A17	100A18	100A19	100A20	100A21	100A22	50A001	50A002	50A003	50A004
100A01	100A02	100A03	100A04	100A05	100A06	100A07	50E003	200A01	200A02	200A03	200A04
10A001 10A012 10A022 10A032 10A041	10A002 10A013 10A023 10A033 10A042	10A003 10A014 10A024 10A034 10A043	10A004 10A015 10A025 10A035 10A044	51	52	53	54	55	56	57	58
65	66	67	68	69	70	71	72	73	74	75	76
100A01	100A02	100A03	100A04	100A05	100A06	100A07	50E003	100A08	100A09	100A10	100A11
81	82	83	84	85	86	87	88	89	90	91	92
500002	500003	500004	500005	500006	500007	500008	500009	200A01	200A02	200A03	200A04
27	28	29	30	31	32	33	34	35	36	37	38
100A15	100A16	100A17	100A18	100A19	100A20	100A21	100A22	50D01A	50D01B	50D01C	50D01D
113	114	115	116	117	118	119	120	121	122	123	124

Figure 1.3-1B

13-18

LM 1.6 KTS (LBR) AIR TO GROUND															
SYNC	SYNC	SYNC	SYNC AND ID SCD01C	01D001	01A005	01A006	01A007	01A008	01A009	01A010	01A011	01A012	01A013	01A014	01A015
1:	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
01D022	01A020	01A021	01A022	01A023	01A024	01A025	01A026	01A027	01A028	01A029	01A030	10D01A	10D01B	10D01C	10D01D
21:	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
01D003	01D004	50E001	50E002	01A042	10A009	10A014	10A016	01A017	10A019	10A024	10A026	01A050	10A029	10A034	10A036
41:	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
01D005	01A058	01A059	01A060	01A061	01A062	01A063	01A064	01A065	01A066	01A067	01A068	01D006	01D007	01D008	01D009
61:	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76
01D010	01E001	01E002	01E003	01A080	01A081	01A082	01A083	01A084	01A085	01A086	01A087	01A088	01A089	01A090	01A091
81:	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
01E004	01A097	01A098	01A099	01A100	01A101	01A102	01A103	01A104	01A105	01A106	01A107	01E005	01E006	01E007	01E008
101:	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116
01E009	01E010	01E011	01E012	01A120	01A121	01A122	01A123	01A124	01A125	01A126	01A127	01A128	01A129	01A130	01A131
121:	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136
01E013	01A137	01A138	01A139	01A140	01A141	01A142	01A143	01A144	01A145	01A146	01A147	01E014	01E015	01E016	01E017
141:	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156
01E018	01E019	01E020	01E021	01A160	01A161	01A162	01A163	01A164	01A165	01A166	01A167	01A168	01A169	01A170	01A171
161:	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176
01E022	01A177	01A178	01A179	01A180	01A181	01A182	01A183	01A184	01A185	01A186	01A187	01E023	01E024	01E025	01E026
181:	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196

200 FRAMES/FRAME 1 FRAME/SEC = 1 DATA CYCLE 8 BITS/WORD

Note: The first two digits of
Channel Code do not represent
the LBR sample rates.

LM LBR X-Y MATRIX

Figure 1.3-2

4.1.6

4.1.6 LM A/G LIST

NOTE: LM discrete measurement numbers have been changed to differentiate between primary and secondary air-to-ground locations. Only the primary meas. will be assigned to R/F bitlevels.

EXAMPLE

GH1513* - The primary channel of GH1513X

GH1513+ - The secondary channel of GH1513X

4.1.6.1

4.1.6.1 LM ALPHA LIST

REV	VEH	MEAS NO	MEAS NAME	S/S	CHL	CODE	BIT	WRD	FRM	LBR	SEQ	REC
LM		GC0071V-3	AC BUS VOLT	001	01A082			069	22	087	1	1
LM		GC0155F A3	AC BUS FREQ	001	01A174			069	45	179	1	1
LM		GC0155F B3	AC BUS FREQ	001	01A158			069	41		1	1
LM		GCC201V-1	BAT. 1 VOLT	001	01A072			101	19		1	1
LM		GC0202V-1	BAT. 2 VOLT	001	01A041			101	11		1	1
LM		GC0203V-1	BAT. 3 VOLT	001	01A079			101	21		1	1
LM		GC0204V-1	BAT. 4 VOLT	001	01A057			101	15		1	1
LM		GC0205V-2	BAT. 5 VOLT	001	01A009			037	10	038	1	1
LM		GC0206V-2	BAT. 6 VOLT	001	01A036			069	33	131	1	1
LM		GC0301V-3	CDR BUS VOLT	001	01A126			069	37	148	1	1
LM		GC0302V-1	SE BUS VOLT	001	01A143			101	37		1	1
LM		GC0302V-3	SE BUS VOLT	001	01A134			069	35	139	1	1
LM		GC1201C-1	BAT. 1 CUR	001	01A091			101	24	096	1	1
LM		GC1201C-3	BAT. 1 CUR	001	01A106			069	28	111	1	1
LM		GC1202C-1	BAT. 2 CUR	001	01A167			101	43	172	1	1
LM		GC1202C-3	BAT. 2 CUR	001	01A122			069	32	127	1	1
LM		GC1203C-1	BAT. 3 CUR	001	01A095			101	25	100	1	1
LM		GC1203C-3	BAT. 3 CUR	001	01A063			069	17	667	1	1
LM		GC1204C A3	BAT. 4 CUR	001	01A067			069	18	071	1	1
LM		GC1204C B3	BAT. 4 CUR	001	01A094			069	25	099	1	1
LM		GC1205C-1	BAT. 5 CUR	001	01A068			101	18	072	1	1
LM		GC1205C-3	BAT. 5 CUR	001	01A102			069	27	107	1	1
LM		GC1206C-1	BAT. 6 CUR	001	01A087			101	23	092	1	1
LM		GC1206C-3	BAT. 6 CUR	001	01A075			069	20	079	1	1
LM		GC4361*	BAT. 1 HI TAP	001	01E030	08	098	35			1	1
LM		GC4362*	BAT. 1 LOW TAP	001	01E030	07	098	35			1	1
LM		GC4363*	BAT. 2 HI TAP	001	01E030	06	098	35			1	1
LM		GC4364*	BAT. 2 LOW TAP	001	01E030	05	098	35			1	1
LM		GC4365*	BAT. 3 HI TAP	001	01E030	04	098	35			1	1
LM		GC4366*	BAT. 3 LOW TAP	001	01E030	03	098	35			1	1
LM		GC4367*	BAT. 4 HI TAP	001	01E030	02	098	35			1	1
LM		GC4368*	BAT. 4 LOW TAP	001	01E030	01	098	35			1	1
LM		GC4369*	BAT. 5 S/U CDR	001	01E033	08	098	39			1	1
LM		GC4370*	BAT. 6 NORM CDR	001	01E033	07	098	39			1	1
LM		GC4371*	BAT. 5 NORM SE	001	01E033	06	098	39			1	1
LM		GC4372*	BAT. 6 S/U SE	001	01E033	05	098	39			1	1
LM		GC4371*	BAT. 1 MAL	001	01E029	08	100	34			1	1
LM		GC4372*	BAT. 2 MAL	001	01E029	07	100	34			1	1
LM		GC4373*	BAT. 3 MAL	001	01E029	06	100	34			1	1
LM		GC4374*	BAT. 4 MAL	001	01E029	05	100	34			1	1

REV	VEH	MEAS NO	MEAS NAME	S/S	CHL	CODE	BIT	WRD	FRM	LBR	SEQ REC
LM	GC9965*	BAT 5	MAL	001	01E029	04	100	34	1	1	1
LM	GC9966*	BAT 6	MAL	001	01E029	03	100	34	1	1	1
LM	GF1083+	SUIT FAN 1	MAL	001	01E016	08	098	20	155	1	1
LM	GF1083*	SUIT FAN 1	MAL	001	01E005	08	098	07	113	1	1
LM	GF1084+	SUIT FAN 2	MAL	001	01E016	07	098	20	155	1	1
LM	GF1084*	SUIT FAN 2	MAL	001	01E005	07	098	07	113	1	1
LM	GF1201+	CDR SUIT DISC		001	01E014	08	098	18	153	1	1
LM	CF1201*	CDR SUIT DISC		001	01E003	08	098	04	084	1	1
LM	GF1202+	SE SUIT DISC		001	01E014	07	098	18	153	1	1
LM	GF1202*	SE SUIT DISC		001	01E003	07	098	04	084	1	1
LM	GF1211+	SUIT RLF CLSD		001	01E016	06	098	20	155	1	1
LM	GF1211*	SUIT RLF CLSD		001	C1E005	06	098	07	113	1	1
LM	GF1212+	SUIT RLF OPEN		001	01E016	05	098	20	155	1	1
LM	GF1212*	SUIT RLF OPEN		001	01E005	05	098	07	113	1	1
LM	GF1221+	SUIT DIV EGRESS		001	01E016	04	098	20	155	1	1
LM	GF1221*	SUIT DIV EGRESS		001	01E005	04	098	07	113	1	1
LM	GF1231+	CABIN RET CLSD		001	01E015	08	098	19	154	1	1
LM	GF1231*	CABIN RET CLSD		001	01E004	08	098	05	101	1	1
LM	GF1232+	CABIN RET OPEN		001	01E015	07	098	19	154	1	1
LM	GF1232*	CABIN RET OPEN		001	01E004	07	098	05	101	1	1
LM	GF1241+	SEC CO2 SEL		001	01E016	03	098	20	155	1	1
LM	GF1241*	SEC CO2 SEL		001	01E005	03	098	07	113	1	1
LM	GF1281T-2	SUIT TEMP		001	01A177	037	46	182	1	1	1
LM	GF1281T-4	SUIT TEMP		001	01A172	005	45	177	1	1	1
LY	GF1301P-1	SUIT PRESS		001	01A147	101	38	152	1	1	1
LY	GF1301P-3	SUIT PRESS		001	01A130	069	34	135	1	1	1
LM	GF1521P-2	CO2 PART PRESS		001	C1A017	037	05	018	1	1	1
LY	GF1521P-4	CO2 PART PRESS		001	C1A046	005	13	049	1	1	1
LM	GF1651T-4	CABIN TEMP		001	01A128	005	34	133	1	1	1
LM	GF2021P-1	PRI GLY PUMP P		001	01A099	101	26	104	1	1	1
LM	GF2021P-3	PRI GLY PUMP P		001	01A059	069	16	063	1	1	1
LM	GF2531T-2	W/B GLY IN TEMP		001	01A137	037	36	142	1	1	1
LM	GF2581T-1	W/B GLY OUT TEMP		001	01A127	101	33	132	1	1	1
LM	GF2921P-2	SECONDARY GLY LOOP PRESS		001	01A043	037	12	1	1	1	1
LM	GF2921P-4	SECONDARY GLY LOOP PRESS		001	01A016	005	05	017	1	1	1
LY	GF2936+	SEL GLY PUMP FAIL		001	C1E015	02	098	19	154	1	1
LM	GF2936*	SEL GLY PUMP FAIL		001	C1E004	02	098	05	101	1	1
LM	GF3071+	Demand REG A CLSD		001	01E015	06	098	19	154	1	1
LM	GF3071*	Demand REG A CLSD		001	01E004	06	098	05	101	1	1
LY	GF3073+	Demand REG B CLSD		001	01E015	04	098	19	154	1	1

REV	VEH	MEAS NO	MEAS NAME	S/S	CHL CODE	BIT	HRD	FRM	LBR	SEQ	REC
L4	LM	GF3073*	DEMAND REG B CLSD	001	01E004	04	098	05	101	1	1
LM	LM	GF3571P-1	CABIN PRESS	001	01A083	101	22	088	1	1	1
L4	LM	GF3571P-3	CABIN PRESS	001	01A098	069	26	103	1	1	1
LM	LM	GF3572+	REPR ELEC OPEN	001	01E014	05	098	18	153	1	1
L4	LM	GF3572*	REPR ELEC OPEN	001	01E003	05	098	04	084	1	1
LM	LM	GF3582P-2	ASC 1 02 PRESS	001	01A028	037	08	030	1	1	1
LM	LM	GF3582P-4	ASC 1 02 PRESS	001	01A012	005	04	013	1	1	1
LM	LM	GF3583P-2	ASC 2 02 PRESS	001	01A097	037	26	102	1	1	1
LM	LM	GF3583P-4	ASC 2 02 PRESS	001	01A073	005	20	077	1	1	1
LM	LM	GF3584P-1	DES 02 PRESS	001	01A131	101	34	136	1	1	1
LM	LM	GF3584P-3	DES 02 PRESS	001	01A142	069	37	147	1	1	1
LM	LM	GF3589P-1	02 MANIFOLD PRESS	001	01A103	101	27	108	1	1	1
LM	LM	GF3589P-3	02 MANIFOLD PRESS	001	01A090	069	24	095	1	1	1
LM	LM	GF3591P-3	U/H RLF PRESS	001	01A194	069	50	199	1	1	1
LM	LM	GF3592P-1	F/H RLF PRESS	001	01A183	101	47	188	1	1	1
LM	LM	GF4101P-2	PRI H2O REG P	001	01A141	037	37	146	1	1	1
L4	LM	GF4101P-4	PRI H2O REG P	001	01A168	005	44	173	1	1	1
LM	LM	GF4501P-3	DESCENT H2O PRESSURE	001	01A033	069	09	1	1	1	1
LM	LM	GF4511T-1	PRI W/B H2O TEMP	001	01A163	101	42	168	1	1	1
LM	LM	GF4511T-3	PRI W/B H2O TEMP	001	01A154	069	40	159	1	1	1
LM	LM	GF4581Q-2	DES H2O QTY	001	01A058	037	16	062	1	1	1
LM	LM	GF4581Q-4	DES H2O QTY	001	01A088	005	24	093	1	1	1
LM	LM	GF4582Q-2	ASC 1 H2O QTY	001	01A020	037	06	022	1	1	1
LM	LM	GF4582Q-4	ASC 1 H2O QTY	001	01A054	005	15	057	1	1	1
LM	LM	GF4583Q-2	ASC 2 H2O QTY	001	01A024	037	07	026	1	1	1
LM	LM	GF4583Q-4	ASC 2 H2O QTY	001	01A050	005	14	053	1	1	1
LM	LM	GF4585T-1	ASC 1 H2O TEMP	001	01A135	101	35	140	1	1	1
LM	LM	GF4585T-3	ASC 1 H2O TEMP	001	01A170	069	44	175	1	1	1
LM	LM	GF4586T-2	ASC 2 H2O TEMP	001	01A013	037	04	014	1	1	1
LM	LM	GF4586T-4	ASC 2 H2O TEMP	001	01A027	005	08	029	1	1	1
L4	LM	GF9986+	SELECTED GLY LEVEL LOW	001	01E014	06	098	18	153	1	1
LM	LM	GF9986*	SELECTED GLY LEVEL LOW	001	01E003	06	098	04	084	1	1
LM	LM	GF9997U-1	GLY PUMP PRESS	001	01A019	101	05	020	1	1	1
LM	LM	GF9997U-3	GLY PUMP PRESS	001	01A029	069	08	031	1	1	1
LM	LM	GF9998U-2	GLY TEMP	001	01A169	037	44	174	1	1	1
LM	LM	GF9998U-4	GLY TEMP	001	01A120	005	32	125	1	1	1
LM	LM	CF9997U-3	H2O SEP RATE	001	01A025	069	07	027	1	1	1
L4	LM	CG0001X	PGNS DATA	050	500SIA	121	00	1	1	1	1
LM	LM	CG0001X	PGNS DATA	050	500SIB	122	00	1	1	1	1
LM	LM	CG0001X	PGNS DATA	050	500SIC	123	00	1	1	1	1

REV	VEH	MEAS NO	MEAS NAME	S/S	CHL	CCODE	BIT	WRD	FRM	LBR	SEQ	REC
	LM	GG0001X	PGNS DATA	050	500SID			124	00	1	1	1
	LM	GG0001X	PGNS DATA	050	50DSIE			125	00	1	1	1
	LM	GG1040V-1	PLS TORQ REF	001	01A049			101	13	1	1	1
	LM	GG1040V-3	PLS TORQ REF	001	01A002			069	01	1	1	1
	LM	GG1110V-2	2.5 VDC TM BIAS	001	01A051			037	14	1	1	1
	LM	GG1110V-4	2.5 VDC TM BIAS	001	01A023			005	07	025	1	1
	LM	GG1201V-2	IMU 28 VAC 800	C01	01A121			037	32	126	1	1
	LM	GG1331V-2	IRIG SUSP 3.2 KC	001	01A005			037	02	006	1	1
	LM	GG1513+	IMU STBY	001	01E017			08	098	22	156	1
	LM	GG1513*	IMU STBY	001	01E006			08	098	08	114	1
	LM	GG1523+	LGC OPR	001	01E017			07	098	22	156	1
	LM	GG1523*	LGC OPR	001	01E0C6			07	098	08	114	1
	LM	GG2001V-1	X PIPA OUT IN C	050	50A005			061	00	1	1	1
	LM	GG2001V-2	X PIPA OUT IN O	050	50A002			058	00	1	1	1
	LM	GG2021V-1	Y PIPA OUT IN O	050	50A001			057	00	1	1	1
	LM	GG2041V-2	Z PIPA OUT IN O	050	50A006			062	00	1	1	1
	LM	GG2041V-3	Z PIPA OUT IN C	050	50A003			059	00	1	1	1
	LM	GG2107V-1	1G SVO ERR IN O	100	100A01			017	00	1	1	1
	LM	GG2107V-2	1G SVO ERR IN O	100	100A09			026	00	1	1	1
	LM	GG2112V-3	1G RSVR OUT SIN	010	10A016			099	02	048	1	1
	LM	GG2113V-3	1G RSVR OUT COS	010	10A014			067	02	047	1	1
	LM	GG2137V-2	1G SVO ERR IN O	100	100A16			050	00	1	1	1
	LM	GG2137V-3	1G SVO ERR IN O	100	100A03			019	00	1	1	1
	L4	GG2142V-2	MG RSVR OUT SIN	010	10A009			034	02	046	1	1
	LM	GG2142V-4	MG RSVR OUT SIN	010	10A040			036	05	1	1	1
	LM	GG2143VA1	MG RSVR OUT COS	001	01A007			101	02	008	1	1
	LM	GG2143VB1	MG RSVR OUT COS	010	10A012			065	02	1	1	1
	LM	GG2167V-1	0G SVO ERR IN O	100	100A19			053	00	1	1	1
	LM	GG2167V-2	0G SVO ERR IN O	100	100A13			030	00	1	1	1
	LM	GG2172V-3	0G RSVR OUT SIN	010	10A024			067	03	051	1	1
	L4	GG2173VA1	0G RSVR OUT COS	010	10A028			033	04	1	1	1
	LM	GG2173VB1	0G RSVR OUT COS	001	01A064			101	17	068	1	1
	LM	GG2219V-4	PITCH ATT ERR	010	10A035			068	04	1	1	1
	LM	GG2245V-4	YAW ATT ERR	010	10A017			100	02	1	1	1
	LM	GG2279V-2	ROLL ATT ERR	010	10A023			066	03	1	1	1
	LM	GG2300T-1	PIPA TEMP	001	01A123			101	32	128	1	1
	LM	GG2300T-3	PIPA TEMP	001	01A166			069	43	171	1	1
	L4	GG3304V-1	RR SHFT SIN	010	10A032			065	04	1	1	1
	LM	GG3305V-3	RR SHFT COS	010	10A010			035	02	1	1	1
	LM	GG3324V-4	RR TRUN SIN	010	10A011			036	02	1	1	1

REV	VEH	MEAS NO	MEAS NAME	S/S	CHL CODE	BIT	WRD	FRM	LBR	SEQ	REC
L4		GG3325V-3	RR TRUN COS	010	10A020		035	03	1	1	1
LM	GG9001+	LGC WARNING		001	01E013		098	17	141	1	1
LM	GG9001*	LGC WARNING		001	01E002		098	03	083	1	1
LM	GG9002+	ISS WARNING		001	01E013		098	17	141	1	1
LM	GG9002*	ISS WARNING		001	01E002		098	03	083	1	1
LM	GH1204*	OUT DET		001	01E031		098	37	1	1	1
LM	GH1214*	AUTO ON		001	01E023		098	29	193	1	1
L4	GH1217*	AUTO OFF		001	01E031		098	37	1	1	1
LM	GH1230*	APS ARM		001	01E041		098	47	.	1	1
LM	GH1240V-1	X TRANS CMD		010	10A001		065	01	1	1	1
LM	GH1241V-1	Y TRANS CMD		010	10A008		033	02	1	1	1
LM	GH1242V-1	Z TRANS CMD		010	10A018		033	03	1	1	1
LM	GH1247V-1	YAW ERR CMD		001	01A139		101	36	144	1	1
L4	GH1247V-4	YAW ERR CMD		010	10A025		068	03	1	1	1
LM	GH1248V-1	PITCH ERR CMD		001	01A155		101	40	160	1	1
L4	GH1248V-2	PITCH ERR CMD		010	10A033		066	04	1	1	1
LM	GH1249V-1	ROLLER ERR CMD		001	01A175		101	45	180	1	1
LM	GH1249V-2	ROLLER ERR CMD		010	10A005		098	01	1	1	1
LM	GH1260*	APS ON		050	50E002		08	032	00	044	1
L4	GH1260*	APS CN		050	50E001		08	024	00	043	1
LM	GH1283*	ABORT STAGE		050	50E002		07	032	00	044	1
LM	GH1283*	ABORT STAGE		050	50E001		07	024	00	043	1
LM	GH1286*	ENGINE FIRE OVERRIDE		001	01E031		06	098	37	1	1
L4	GH1301*	OPS CN		001	01E023		07	098	29	193	1
LM	GH1311V-4	MAN THRUST CMD		001	01A132		005	35	137	1	1
LM	GH1313V-1	PITCH GDA POS		001	01A022		101	06	024	1	1
LM	GH1313V-3	PITCH GDA POS		010	10A030		035	04	1	1	1
L4	GH1314V-1	ROLL GDA POS		001	01A011		101	03	012	1	1
LM	GH1314V-4	ROLL GDA POS		010	10A031		036	04	1	1	1
LM	GH1323*	P TRK FAIL		001	01E023		06	098	29	193	1
LM	GH133C*	R TRK FAIL		001	01E023		05	098	29	193	1
LM	GH1311V-3	AUTO THRUST CMD		001	01A186		069	48	191	1	1
LM	GH1311V-4	AUTO THRUST CMD		010	10A021		036	03	1	1	1
LM	GH1411*	DPS ARM		001	01E041		07	098	47	1	1
LM	GH1420*	JD 4U OUTPUT		100	100E02		01	016	00	1	1
LM	GH1420*	JD 4U OUTPUT		100	100E01		01	008	00	1	1
LM	GH1421*	JD 4D OUTPUT		100	100E02		02	016	00	1	1
LM	GH1421*	JD 4F OUTPUT		100	100E04		01	048	00	1	1
LM	GH1421*	JD 4S OUTPUT		100	100E04		02	048	00	1	1

REV	VEH	MEAS NO	MEAS NAME	S/S	CHL	CODE	BIT	WRD	FRM	LBF	SEQ	REC
LM	GH1422*	JD 3U OUT		100	100E02	03	016	00		1	1	
LM	GH1422*	JD 3U OUT		100	100E01	03	008	00		1	1	
LM	GH1423+	JD 3D OUT		100	100E02	04	016	00		1	1	
LM	GH1423*	JD 3D OUT		100	100E01	04	008	00		1	1	
LM	GH1424*	JD 3F CUI		100	100E04	03	048	00		1	1	
LM	GH1425*	JD 3S OUT		100	100E04	04	048	00		1	1	
LM	GH1426+	JD 2U OUT		100	100E02	05	016	00		1	1	
LM	GH1426*	JD 2U CUI		100	100E01	05	008	00		1	1	
LM	GH1427+	JD 2D OUT		100	100E02	06	016	00		1	1	
LM	GH1427*	JD 2D OUT		100	100E01	06	008	00		1	1	
LM	GH1428*	JD 2F OUT		100	100E04	05	048	00		1	1	
LM	GH1429*	JD 2S OUT P_U		100	100E04	06	048	00		1	1	
LM	GH143C+	JD 1U OUTPUT		100	100E02	07	016	00		1	1	
LM	GH143C*	JD 1U OUTPUT		100	100E01	07	008	00		1	1	
LM	GH1431+	JD 1D OUTPUT		100	100E02	08	016	00		1	1	
LM	GH1431*	JD 1D OUTPUT		100	100E01	08	003	00		1	1	
LM	GH1432*	JD 1F OUTPUT		100	100E04	07	048	00		1	1	
LM	GH1433*	JD 1S OUTPUT		100	100E04	08	048	00		1	1	
LM	GH1455V-1	YAW ATT ERR		001	01A026	101	07	028		1	1	
LM	GH1455V-3	YAW ATT ERR		010	10A039	035	05	01		1	1	
LM	GH1455V-4	YAW ATT ERR		010	10A015	068	02	01		1	1	
LM	GH1456V-1	PITCH ATT ERR		001	01A060	101	16	064		1	1	
LM	GH1456V-2	PITCH ATT ERR		010	10A042	066	05	01		1	1	
LM	GH1456V-4	PITCH ATT ERR		010	10A007	100	01	01		1	1	
LM	GH1457VAL	ROLL ATT ERR		001	01A115	101	30	120		1	1	
LM	GH1457V81	ROLL ATT ERR		010	10A037	033	05	01		1	1	
LM	GH1457V-2	RCLL ATT ERR		010	10A013	066	02	01		1	1	
LM	GH1461V-2	RGA YAW RATE		010	10A019	034	0	050		1	1	
LM	GH1461V-3	RGA YAW RATE		010	10A043	067	05	059		1	1	
LM	GH1462V-2	RGA PITCH RATE		010	10A029	034	04	054		1	1	
LM	GH1462V-3	RGA PITCH RATE		010	10A045	099	05	060		1	1	
LM	GH1463V-2	RGA ROLL RATE		010	10A038	034	05	058		1	1	
LM	GH1463V-3	RGA ROLL RATE		010	10A034	067	04	055		1	1	
LM	GH1603*	MIN DRND		001	01E041	06	098	47		1	1	
LM	GH1621*	AGS SEL		001	01E023	04	098	29	193	1	1	
LM	GH1628*	FCLL PLSD/DIR		001	01E027	08	098	33		1	1	
LM	GH1629*	PITCH PLSD/DIR		001	01E027	07	098	33		1	1	
LM	GH1630*	YAW PLSD/DIR		001	01E027	06	098	33		1	1	
LM	GH1641*	AGS MODE AUTO		001	01E031	01	098	37		1	1	
LM	GH1642*	AGS MODE ATT HOLD		001	01E031	02	098	37		1	1	

REV	VEH	MEAS NO	MEAS NAME	S/S	CHL	CODE	BIT	HRD	FRM	LBR	SEQ	REC
LM	GH1643*	PNG MODE AUTO	001	01E031	05	098	37	1	1	1	1	1
LM	GH1644*	PNG MODE ATT HOLD	001	01E031	04	098	37	1	1	1	1	1
LM	GH1893*	X TRANS OVERRIDE	001	01E041	05	098	47	1	1	1	1	1
LM	GH1896*	UNBAL CPLS	001	01E031	03	098	37	1	1	1	1	1
LM	GI0001X	AGS DATA	050	50DS2A	126	00		1	1	1	1	1
LM	GI0001X	AGS DATA	050	50DS2B	127	00		1	1	1	1	1
LM	GI0001X	AGS DATA	050	50DS2C	128	00		1	1	1	1	1
LM	GI3301T-2	ASA TEMP	201	01A089	037	24	094	1	1	1	1	1
LM	GI3301T-4	ASA TEMP	001	01A065	005	18	069	1	1	1	1	1
LM	GI3305*	AGS WARMUP	001	01E027	05	098	33	1	1	1	1	1
LM	GI3306*	AGS STBY	001	01E027	04	098	33	1	1	1	1	1
LM	GLO300A	FRAME SYNC + 10	050	50D01A	001	00	001	1	1	1	1	1
LM	GLO300B	FRAME SYNC + 10	050	50D01B	002	00	002	1	1	1	1	1
LM	GLC300C	FRAME SYNC + 10	050	50D01C	003	00	003	1	1	1	1	1
LM	GLC300D	FRAME SYNC + 10	050	50D01D	004	00	004	1	1	1	1	1
LM	GLC302X	FORMAT ID	001	01D001	005	01	005	1	1	1	1	1
LM	GL0400+	PCM OSC FAIL 1	001	01E018	01	098	23	161	1	1	1	1
LM	GL0400*	PCM OSC FAIL 1	001	01E007	01	098	09	115	1	1	1	1
LM	GL0401V-1	CAL 85 PCT	010	10A041	065	05	05	1	1	1	1	1
LM	GL0401V-3	CAL 85 PCT	010	10A026	099	03	052	1	1	1	1	1
LM	GL0402V-3	CAL 15 PCT	010	10A036	099	04	056	1	1	1	1	1
LM	GL0402V-4	CAL 15 PCT	010	10A027	100	03		1	1	1	1	1
LM	GL0422V-1	PCM CSC FAIL 2	001	01A171	101	44	176	1	1	1	1	1
LM	GL0423V-2	PCM CSC FAIL 3	001	01A085	037	23	090	1	1	1	1	1
LM	GL0501W	MET	010	10D01A	033	01	033	1	1	1	1	1
LM	GL0501W	MET	010	10D01B	034	01	034	1	1	1	1	1
LM	GLC501W	MET	010	10D01C	035	01	035	1	1	1	1	1
LM	GL4026+	CES AC PWR FAIL	001	C1E018	08	098	23	161	1	1	1	1
LM	GL4026*	CES AC PWR FAIL	001	01E007	08	098	09	115	1	1	1	1
LM	GL4027+	CES DC PWR FAIL	001	01E018	07	098	23	161	1	1	1	1
LM	GL4027*	CES DC PWR FAIL	001	01E007	07	098	09	115	1	1	1	1
LM	GL4028+	AGS PWR FAIL	001	01E018	06	098	23	161	1	1	1	1
LM	GL4028*	AGS PWR FAIL	001	01E007	06	098	09	115	1	1	1	1
LM	GL4047+	EPS BATT CAUT	001	01E018	03	098	23	161	1	1	1	1
LM	GL4047*	EPS BATT CAUT	001	01E007	03	098	09	115	1	1	1	1
LM	GL4054+	C+N PWR FAIL	001	01E018	05	098	23	161	1	1	1	1
LM	GL4054*	C+N PWR FAIL	001	01E007	05	098	09	115	1	1	1	1
LM	GL4059+	MASTER ALARM CN	001	01E018	04	098	23	161	1	1	1	1
LM	GL4069*	MASTER ALARM ON	001	01E007	04	098	09	115	1	1	1	1

REV	VEH	MEAS NO	MEAS NAME	S/S	CHL	CODE	BIT	WRD	FRM	LBR	SEQ	REC
LM	GL8275T-4	RTG CASK SHLD TEMP	001	01A180	005	47	185	1	1	1	1	1
LM	GM5000*	LAND GEAR DEPLOY	001	01E040	08	098	45			1	1	1
LM	GN7521+	LR RANGE BAD	001	01E012	08	098	15	124	1	1	1	1
LM	GN7521*	LR RANGE BAD	001	01E001	08	098	02	082	1	1		
LM	GN7557+	LR VEL BAD	001	01E012	07	098	15	124	1	1	1	1
LM	GN7557*	LR VEL BAD	001	01E001	07	098	02	082	1	1	1	1
LM	GN7563T-2	LR ANT TEMP	001	01A149	037	39						
LM	GN7563T-4	LR ANT TEMP	001	01A164	005	43	169	1	1	1	1	1
LM	GN7621+	RR NO TRACK	001	01E012	06	098	15	124	1	1	1	1
LM	GN7621*	RR NO TRACK	001	01E001	06	098	02	082	1	1	1	1
LM	GN7723T-2	RR ANT TEMP	001	01A055	037	15						
LM	GN7723T-3	RR ANT TEMP	001	01A138	069	36	143	1	1	1	1	1
LM	GN7723T-4	RR ANT TEMP	001	01A031	005	09						
LM	GP0001P-1	APS HE 1 PRESS	001	01A179	101	46	184	1	1	1	1	1
LM	GPC001P-2	APS HE 1 PRESS	001	01A153	037	40	158	1	1	1	1	1
LM	GP0002P-2	APS HE 2 PRESS	001	01A093	037	25	098	1	1	1	1	1
LM	GP0002P-4	APS HE 2 PRESS	001	01A100	005	27	105	1	1	1	1	1
LM	GP0018P-2	REG OUT MNFLD	001	01A070	037	19						
LM	GPC025P-3	APS HE REG PRESS	001	01A037	069	10	039	1	1	1	1	1
LM	GP0041P-4	P NG2 HE SUP 1	010	10A006	068	01						
LM	GP0042P-1	P ND2 HE SUP 2	010	10A022	065	03						
LM	GP0318*	APS HE 1 CLSD	001	01E043	08	098	49			1	1	1
LM	GP0320*	APS HE 2 CLSD	001	01E043	07	098	49			1	1	1
LM	GPC718T-3	APS FUEL TEMP	001	01A114	069	30	119	1	1	1	1	1
LM	GP0908*	APS FUEL LO	001	01E024	08	100	29	194	1	1	1	1
LM	GP1218T-2	APS CX TEMP	001	01A129	037	34	134	1	1	1	1	1
LM	GP1218T-4	APS OX TEMP	001	01A144	005	38	149	1	1	1	1	1
LM	GP1408*	APS CX LO	001	01E024	07	100	2	194	1	1	1	1
LM	GP1501P-2	APS FUEL PRESS	001	01A062	037	17	066	1	1	1	1	1
LM	GP1501P-4	APS FUEL PRESS	001	01A092	005	25	097	1	1	1	1	1
LM	GP1503P-2	APS OX PRESS	001	01A105	037	28	110	1	1	1	1	1
LM	GP1503P-4	APS OX PRESS	001	01A061	005	17	065	1	1	1	1	1
LM	GP2010PA3	APS TCP	200	20A007	015	00						
LM	GP2010PB3	APS TCP	001	01A178	069	46	183	1	1	1	1	1
LM	GP2010CP-2	APS TCP	001	01A173	037	45	178	1	1	1	1	1
LM	GP2997*	PROP VLVS DEL P	001	01E032	06	098	38					
LM	GP2998*	PROP VLVS DEL P	001	01E032	05	098	38					
LM	GQ3015P-3	DPS START TANK PRESS	301	01A040	069	11						
LM	GQ3018P-4	DPS HE REG PRESS	001	01A042	005	12	045	1	1	1	1	1
LM	GQ3025P-4	DPS HE REG PRESS	001	01A108	005	29						

REV	VEH	MEAS NO	MEAS NAME	S/S	CHL	CODE	BIT	WRD	FRM	LBR	SEQ	REC
LM	G03435P-1	DPS HE PRESS	001	01A030	101	08	032	1	1			
LM	G03435P-3	DPS HE PRESS	001	01A006	069	02	007	1	1			
LM	G03603Q-1	DPS FUEL 1 QTY	100	100A08	025	00						
LM	G03603Q-2	DPS FUEL 1 QTY	001	01A077	037	21						
LM	G03603Q-4	DPS FUEL 1 QTY	001	01A104	005	28	109	1	1			
LM	G03604Q-2	DPS FUEL 2 QTY	001	01A101	037	27	106	1	1			
LM	G03604Q-3	DPS FUEL 2 QTY	100	100A21	055	00						
LM	G03604Q-4	DPS FUEL 2 QTY	001	01A069	005	19						
LM	G03611P-1	DPS FUEL PRESS	200	200A01	009	00						
LM	G03611P-3	DPS FUEL PRESS	001	01A018	069	05	019	1	1			
LM	G03718T-4	DPS FUEL PRESS	200	200A04	012	00						
LM	G03718T-2	DPS TEMP	001	01A047	037	13						
LM	G03718T-4	DPS TEMP	001	01A0C4	005	02						
LM	G03719T-2	DPS TEMP	001	01A117	037	31						
LM	G03719T-4	DPS TEMP	001	01A148	005	39						
LM	G041030A4	DPS OX 1 QTY	001	01A116	005	31						
LM	G041030B4	DPS OX 1 QTY	100	100A11	028	00						
LM	G041030-2	DPS OX 1 QTY	001	01A165	037	43	170	1	1			
LM	G04104Q-2	DPS CX 2 QTY	001	01A133	037	35	138	1	1			
LM	G04104Q-3	DPS CX 2 QTY	100	100A07	023	00						
LM	G04104Q-4	DPS CX 2 QTY	001	01A176	005	46						
LM	G04111P-1	DPS OX• PRESS	200	200A05	013	00						
LM	G04111P-2	DPS OX• PRESS	200	200A02	010	00						
LM	G04111P-3	DPS OX• PRESS	001	01A010	069	03	011	1	1			
LM	G04218T-1	DPS OX 1 TEMP	001	01A003	101	01						
LM	G04218T-3	DPS CX 1 TEMP	001	01A048	069	13						
LM	G04219T-1	DPS OX 2 TEMP	001	01A034	101	09						
LM	G04219T-3	DPS OX 2 TEMP	001	01A056	069	15						
LM	G04220T-2	DPS BALL VAL TEMP	001	01A113	037	30	118	1	1			
LM	G04455*	DPS PROP LC	001	01E032	07	098	38					
LM	G06510P-1	DPS TCP	001	01A076	101	20	080	1	1			
LM	G06510P-2	DPS TCP	200	200A06	014	00						
LM	G06510P-3	DPS TCP	001	01A086	069	23	091	1	1			
LM	G06806HA4	VAR INJ ACT POS	050	50A004	060	00						
LM	G06806HB4	VAR INJ ACT POS	050	50A008	064	00						
LM	G06806H-2	VAR INJ ACT POS	001	01A193	037	50	198	1	1			
LM	GR1085Q-1	RCS PROP A QTY	001	01A151	101	39						
LM	GR1085Q-3	RCS PROP A QTY	001	01A162	069	42	167	1	1			
LM	GR1095Q-1	RCS PROP B QTY	001	01A119	101	31						
LM	GR1C95Q-3	RCS PROP B QTY	001	01A146	069	38	151	1	1			

REV	VEH	MEAS NO	MEAS NAME	S/S	CHL	CODE	BIT	WRD	FRM	LBR	SEQ	REC
LM	CR1101P-2	FCS A HE PRESS	001	01A125	037	33	130	1	1	1	1	1
LM	CR1101P-4	PCS A HE PRESS	001	01A160	005	42	165	1	1	1	1	1
LM	CR1102P-2	RCS B HE PRESS	001	01A145	037	38	150	1	1	1	1	1
LM	CR1102P-4	RCS B HE PRESS	001	01A124	005	33	129	1	1	1	1	1
LM	CR1201P-3	RCS A REG PRESS	001	01A110	069	29	1	1	1	1	1	1
LM	CR1201P-4	RCS A REG PRESS	001	01A112	005	30	117	1	1	1	1	1
LM	CR1202P-4	RCS B REG PRESS	001	01A140	005	37	145	1	1	1	1	1
LM	CR2121T-2	RCS A FUEL TEMP	001	01A066	037	18	070	1	1	1	1	1
LM	CR2122T-2	RCS B FUEL TEMP	001	01A074	037	20	078	1	1	1	1	1
LM	CR2201P-1	A FUEL MFLD PRESS	001	01A045	101	12	1	1	1	1	1	1
LM	GR2201P-3	A FUEL MFLD PRESS	001	01A014	069	04	015	1	1	1	1	1
LM	GR2202P-1	B FUEL MFLD PRESS	001	01A015	101	04	016	1	1	1	1	1
LM	GR2202P-3	B FUEL MFLD PRESS	001	01A044	069	12	1	1	1	1	1	1
LM	GR3201P-1	A OX MFLD PRESS	001	01A053	101	14	1	1	1	1	1	1
LM	GR3201P-3	A OX MFLD PRESS	001	01A021	069	06	023	1	1	1	1	1
LM	GR3202P-1	B OX MFLD PRESS	001	01A038	101	10	040	1	1	1	1	1
LM	GR3202P-3	B OX MFLD PRESS	001	01A052	069	14	1	1	1	1	1	1
LM	GRF031*	RCS TCP 4U	200	200E1A	01	006	00	1	1	1	1	1
LM	GP5032*	RCS TCP 4D	200	200E1A	02	006	00	1	1	1	1	1
LM	GR5033*	FCS TCP 4F	200	200E1A	03	006	00	1	1	1	1	1
LM	GR5034*	RCS TCP 4S	200	200E1A	04	006	00	1	1	1	1	1
LM	GR5035*	RCS TCP 3U	200	200E1A	05	006	00	1	1	1	1	1
LM	GR5036*	RCS TCP 3D	200	200E1A	06	006	00	1	1	1	1	1
LM	GR5037*	RCS TCP 3F	200	200E1A	07	006	00	1	1	1	1	1
LM	GR5038*	RCS TCP 3S	200	200E1A	08	006	00	1	1	1	1	1
LM	GR5039*	RCS TCP 2U	200	200E1B	01	007	00	1	1	1	1	1
LM	GR5040*	RCS TCP 2D	200	200E1B	02	007	00	1	1	1	1	1
LM	GR5041*	RCS TCP 2F	200	200E1B	03	007	00	1	1	1	1	1
LM	GR5042*	RCS TCP 2S	200	200E1B	04	007	00	1	1	1	1	1
LM	GR5042*	RCS TCP 1U	200	200E1B	05	007	00	1	1	1	1	1
LM	GR5044*	RCS TCP 1D	200	200E1B	06	007	00	1	1	1	1	1
LM	GR5045*	RCS TCP 1F	200	200E1B	07	007	00	1	1	1	1	1
LM	GR5046*	RCS TCP 1S	200	200E1B	08	007	00	1	1	1	1	1
LM	GR6001T-4	QUAD 4 TEMP	001	01A008	005	03	009	1	1	1	1	1
LM	GR6002T-4	QUAD 3 TEMP	001	01A035	005	10	037	1	1	1	1	1
LM	GR6003T-4	QUAD 2 TEMP	001	01A080	005	22	085	1	1	1	1	1
LM	GF6004T-4	QUAD 1 TEMP	001	01A084	005	23	089	1	1	1	1	1
LM	GR9609+	RCS MAIN A-CLSD	001	01E021	06	098	27	164	1	1	1	1
LM	GR9609*	RCS MAIN A CLSD	001	01E010	06	098	13	122	1	1	1	1
LM	GR9610+	RCS MAIN B CLSD	001	01E021	05	098	27	164	1	1	1	1

REV	VEH	MEAS NO	MEAS NAME	S/S	CHL	CRC	BIT	WRD	FRM	LBR	SEQ REC
	LN	GR9610*	RCS MAIN B CLSD	001	01E010	C5	093	13	122	1	1
	LN	GR9613+	A/3 XFEED COPEN	001	01E021	02	098	27	164	1	1
	LN	GR9613#	A/B XFEED OPEN	001	01E010	02	098	15	122	1	1
	LN	GR9631+	ASC FEED A OPEN	001	01E021	C4	098	27	164	1	1
	LN	GR9631*	ASC FEED A OPEN	001	01E01C	04	098	13	122	1	1
	LN	GF9632+	ASC FE ED B OPEN	001	01E021	03	098	27	164	1	1
	LN	GF9632#	ASC FEED B OPEN	001	01E010	03	098	13	122	1	1
	LN	GR9641+	SIG ASC FEED A CX OPEN	001	01E021	08	098	27	164	1	1
	LN	GR9641*	SIG ASC FEED A CX OPEN	001	01E010	08	098	13	122	1	1
	LN	GR9642+	SIG ASC FEED B CX OPEN	001	01E021	C7	098	27	164	1	1
	LN	GR9642#	SIG ASC FEED B CX OPEN	001	01E010	07	098	13	122	1	1
	LN	GP9661*	4A ISO CLSD	001	01E042	08	098	48		1	1
	LN	GP9662*	4B ISO CLSD	001	01E042	07	098	48		1	1
	LN	GR9663*	3A ISC CLSD	001	01E042	06	098	48		1	1
	LN	GR9664*	2A ISO CLSD	001	01E042	05	098	48		1	1
	LN	GR9655*	2A ISO CLSD	001	01E042	04	098	48		1	1
	LN	GR9656*	2B ISC CLSD	001	01E042	C3	098	48		1	1
	LN	GR9667*	1A ISO CLSD	001	01E042	02	098	48		1	1
	LN	GR9668*	1B ISO CLSD	001	01E042	01	098	48		1	1
	LN	GT0441X	DUA STATUS	050	50D002	097	00	00		1	1
03 03	LN	GT0454+/-	S-BAND ANT TEMP	001	01A107	101	28	112	1	1	1
	LN	GT0625V-2	VHF B RECEIVER AGC	001	01A081	037	22	086	1	1	1
	LN	GT0625V-4	VHF B RECEIVER AGC	001	01A096	005	26		1	1	1
	LN	GT0992BA2	S-BND ST PH EPR	001	01A185	037	48	190	1	1	1
	LN	GT0992BB2	S-BND ST PH EPR	010	10A002	066	01		1	1	1
	LN	GT0993E-1	S-BND XMTR PO	001	01A195	101	50	200	1	1	1
	LN	GT0994V-2	S-BND RCVR SIG	001	01A161	037	42	166	1	1	1
	LN	GT0994V-4	S-BND RCVR SIG	001	01A152	005	40	157	1	1	1
	LN	GY0050+	ABORT CMD	001	01EC22	08	098	28	181	1	1
	LN	GY0050#	ABORT CMD	001	01EC11	C8	098	14	123	1	1
	LN	GY0201+	FD PLY A K3-K6	001	01E022	03	098	28	181	1	1
	LN	GY0201*	ED RLY A K3-K6	001	01E011	03	098	14	123	1	1
	LN	GYC202+	ED RLY B K3-K6	C01	01E022	02	098	28	181	1	1
	LN	GYC202#	ED RLY B K3-K6	001	01E011	02	098	14	123	1	1
	LN	GYC231+	ED RLY A K7-K15	001	01E022	C5	098	28	181	1	1
	LN	GYC231*	ED RLY A K7-K15	C01	01E011	05	098	14	123	1	1
	LN	GY0232+	ED RLY B K7-K15	001	01E022	04	098	28	181	1	1
	LN	GY0232*	ED RLY B K7-K15	001	C1E011	C4	098	14	123	1	1